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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/510,599	LECOMTE, MICHEL	
	Examiner	Art Unit	
	JOHANNES P. MONDT	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 November 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5 and 11-21* is/are pending in the application.

4a) Of the above claim(s) *12-14* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5,11 and 15-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Amendment filed 11/05/08 forms the basis of the following Office action. In said Amendment applicant substantially amended claims 5, 11 and 15-21. Comments on "Remarks" submitted with said Amendment are included below under "Response to Arguments".

Response to Arguments

2. Applicant's arguments filed 11/05/2008 have been fully considered but they are not persuasive.

Applicant's first argument is one of non-analogous art: Griepentrog being a high-temperature ("at least 800 C"), while Nathenson being "not a high temperature reactor" (page 11 of Remarks).

In response: first, it is only through the current amendment that this argument is at all related to the claim language.

Furthermore, the portion of the amendment essential for applicant's argument introduced new matter, because a definition of "high-temperature" as having "an operating temperature of at least 800 C" is not found in the Specification: instead the Specification offers *only by example* "a high temperature in the operating nuclear reactor", a temperature *higher than* 800 C (page 1, 2nd par., and page 8, lines 3-7). There is a difference between example and definition. There also is a difference between "higher than" and "at least". Specifically, "at least 800 C" is not encompassed by "higher than".

Moreover, applicant's characterization of Nathenson as being restricted to an operating temperature of 500 C is incorrect as well: instead, Nathenson et al teach that the primary fluid is heated to a temperature on the order of 500 C (col. 6, line 2: "on the order of 500 C", to which passage applicant refers in Remarks (sic)). Within context, "order", as a number having a magnitude, may be interpreted as "order of magnitude", which implies a rather broad statement.

Moreover, applicant's argument is also unpersuasive because the primary coolant is not necessarily heated to the core temperature, because whether or not the primary coolant reaches saturation temperature depends inter alia on the coolant flow rate. See, for instance, the English abstract of Meguro et al (JP-07225293A). In conclusion, on core temperature in Nathenson et al, said core temperature may well be substantially higher than the temperature reached by the primary coolant, which itself in turn may be substantially higher than applicant's misquote of 500 C, which should have been "on the order of 500 C".

Furthermore, nowhere in the Specification as originally filed is it disclosed that "a primary portion connected to the secondary circuit receiving the second exchange gas after it issues from the gas turbine at a temperature between 550 C and 700 C". The limitation thus constitutes new matter.

In response to applicant's argument that Nathenson et al is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the

claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Nathenson et al is reasonably pertinent to the particular problem with which applicant was concerned because Applicant's invention, Griepentrog and Nathenson et al are all concerned with heat exchange technology applied to nuclear reactors in which the core temperature is substantially higher than the 320 C quoted by applicant for PWR reactors in juxtaposition for contrast (page 1 of the Specification), and in comparison with which both Griepentrog and Nathenson et al disclose nuclear reactors of a relatively high temperature..

As explained in the previous office action, what needs to be learned from Nathenson et al, is only the addition of a final, tertiary circuit in the form of a steam cycle 34 (see reference to col. 6, l. 17-25 in said Office Action). The only feature not comprised in Griepentrog et al is the tertiary circuit, while whether the steam loop is at the low-temperature end of liquid metal cycles as in Nathenson et al or at the low end of gas cycles when implemented in Griepentrog is irrelevant for the motivation because in both cases said steam loop offers an increase in electrical efficiency through reduction of the temperature of the respective metal or gas working fluids, which provides in itself ample motivation to combine the teaching by Nathenson et al with the invention by Griepentrog. See the cited portion on col. 2, l. 62-64 in Nathenson et al. Additionally, see also col. 4, l. 38-47 to witness the key role of the steam in the cooling of the metal working fluid in Nathenson et al.

With regard to Applicant's traverse of motivations a) and b), Applicant's allegation of contradiction between gentler drop in temperature and reduction in temperature

(page 12, third full par.) is not correct because an increase in the number of cycles allows the final temperature to be lower AND the temperature drops between cycles to be lower as well. Differences between Carnot cycle and "real life" as applicant puts it in his traverse in paragraphs four and five on page 12, are acknowledged, however Carnot cycle considerations are commonly and frequently made to guide design as an ideal to optimally approximate, as witnessed, for instance, by Kantor (US 4,010,018) (cols. 46-47, the section on "Cascade Compressor with Internal Fuel Oxidation" in a patent on heat exchange technology) actually recommending to approach the Carnot cycle more closely by the selection of a design based on several thermodynamic cycles rather than a single one; and Terry et al (US 4,537,031) (see "Background of the Invention") stating the well-known fact that the Carnot cycle defines the limit of thermal efficiency that can be realized in real heat exchange systems. The relevance of the Carnot cycle in "real life" systems is thus real enough to enter design considerations. Parenthetically, both Kantor and Terry have nuclear reactor relevance. Furthermore, although adding a thermodynamic cycle may thus be seen to improve the thermodynamic efficiency one of ordinary skill in the art would have deemed it obvious that cost considerations always are involved and weigh in on the other side in favor of simplicity of design. One of ordinary skill in the art would also recognize that adding another cycle to two existing ones does not mean that the addition of another cycle is not a design choice simply because no one has ten cycles. Therefore, applicant's arguments ad (a) and (b) (page 12) fail to persuade.

In light of the above, none of applicant's arguments are persuasive and accordingly claim 5 stands rejected.

<u>Claim 15:</u>

Noting first that the first sentence on page 14 is unfinished and hence cannot be reasonably be expected to be responded to, counter to applicant's argument (page 14, second and third pars.) that "Squires does not teach first and second heat exchangers (13a, 13b) to have a primary portion supplied with heat exchange gas from **bypasses** of the secondary circuit (9)" (emphasis by applicant) (see page 14, second sentence) heat exchange circuit 21/22 clearly delivers working fluid to heat exchangers 14/15/16 through bypasses (Figure 2 and col. 8, l. 11+) because the main steam line is between turbines 5 and 7. Therefore, said argument fails to persuade.

Applicant's argument (page 14, fourth par.) that Squires in non-analogous art because Squires requires not only nuclear but also a fossil fuel power plant does not persuade either, because (1) the addition of fossil power does not detract from the analogy between the inventions as they are all in the art of heat exchange technology for power, even nuclear power; (2) what needs to be learned from Squires is independent of the primary heat source.

Counter to applicant's argument that motivation is different by Squires than "feature" different from those of claim 15 it is clear that central to the improved efficiency as disclosed by Squires is the reheating of the steam (see abstract and "Summary of the Invention") while said reheating is in part enabled by the bypasses from 21/22 to 14/15/16; therefore, said argument fails to persuade.

Claim 16:

Applicant's argument (spanning pages 14 and 15) in traverse based on what Werker et al do not allegedly teach is far too demanding in light of what is needed from Werker et al, considering the claim language. The inclusion of a pre-heater (16) (apart from a simply valve 15) immediately upstream from the steam generator 2, when combined with Griepentrog, Nathenson et al and Squires, meets the claim language.

While not officially challenging the Official Notice, applicant does appear to argue the efficiency is improved by preheating input into a steam generator; examiner offers Maier et al (US 3,889,641), especially col. 1, l. 30+.

Arguments in traverse of "section 16" (see page 15) are not fully understood: examiner is not aware of any such rejection of any section 16, but, in light of the arguments referring to Berchtold, assumes herewith that the arguments are in traverse of the rejection of claim 21. In any event, examiner maintains in connexion with the rejection not dependent upon Berchtold et al that the claimed range is not critical to the invention for the reasons provided, for which no traverse is included. Berchtold et al was only cited to provide evidence that compression ratios of 2.5 are indeed common in the art of gas turbines for power plants.

In light of the above, applicant's arguments are not found to be persuasive also with regard to claims 16 and 21.

The substantially amended claim language is again examined for the first, and at the earliest possible, time.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. ***Claim 19*** is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for small deviations from pressure equilibration between first and second heat exchange gases, does not reasonably provide enablement for conditions under reactor operation wherein pressure differences can exist between the first heat exchange gas and the second heat exchange gas ordained by the power level of the nuclear reactor. It has to be kept in mind that pressure equalizing not through the exchange of material (fluid) but exclusively through the movement of pistons and in particular without any exchange of gas particles, -which is implicit in the claim language because of the recitation of the pressure equalizing valve and the entirely closed nature of the secondary circuit, is limited to the maximally achievable volume change imparted on first and second heat exchange gases by the piston movements that form the mechanism of operation of the disclosed pressure equalizing valve 20 . Therefore, the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to enable the invention commensurate in scope with the claim.

3. ***Claims 5, 11, 20 and 21*** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject

matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention, because a definition of "high-temperature" as having "an operating temperature of at least 800 C" is not found in the Specification: instead the Specification offers *only by example* "a high temperature in the operating nuclear reactor", a temperature *higher than* 800 C (page 1, 2nd par., and page 8, lines 3-7). There is a difference between example and definition. There also is a difference between "higher than" and "at least". Specifically, "at least 800 C" is not encompassed by "higher than". The limitation thus constitutes new matter.

4. ***Claims 5, 11, 20 and 21*** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Nowhere in the Specification as originally filed is it disclosed that a primary portion connected to the secondary circuit receiving the second exchange gas after it issues from the gas turbine at a temperature between 550 C and 700 C". The limitation thus constitutes new matter.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. ***Claim 19*** is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: the thermodynamic

parameters under the claimed “pressure equalizing valve" has the capability to equalize the pressure, given that reactor temperature of the core and of the first and second heat exchange are provided with a range, whilst the volume occupied by said first and second heat exchange gases are not. Neither are the dimensions of the pistons comprised in the valve. Pressure change can only be imparted by causing a volume change, volume and pressure to a good approximation both for gases and steam being related through an inverse proportionality, to which Examiner takes official notice.

7. ***Claims 5, 11, 20 and 21*** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The new matter discussed in section 3 above implies the metes and bounds of the claimed invention to be vague and ill-defined, thus causing the claims to be indefinite.

8. ***Claims 5, 11, 20 and 21*** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The new matter discussed in section 4 above implies the metes and bounds of the claimed invention to be vague and ill-defined, thus causing the claims to be indefinite.

9. ***Claims 5, 11, 20 and 21*** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The limitation “and a primary portion connected to the secondary circuit receiving the second exchange gas after it issues from the gas turbine at a temperature between 550 C and 700 C” is poly-interpretable

because the claimed temperature may be interpreted as the temperature at the point of being received by the primary portion of the steam generator or at the point of being issued by the gas turbine. Clearly a decline in temperature therebetween is inherent and hence two mutually exclusive interpretations of the claim language render the claims indefinite as the metes and bounds of the claimed invention remain ill-defined and vague.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. ***Claims 5 and 20*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Griepentrog et al (GB 2 050 679 A) (see IDS filed 10/12/04; previously cited) in view of Nathenson et al (4,842,054) (previously cited). The rejections are provided subject to the noted indefiniteness under 35 USC 112, 2nd paragraph, as discussed above in sections 7-9, and are offered to the best of examiner's understanding, in which a temperature difference as discussed in section 9 is ignored..

Griepentrog et al teach (Figures 1 and 3) a device *capable of* producing electricity from the heat produced in the core (within 1) of at least one high-temperature nuclear reactor 1 comprising a primary circuit (i.e., closed circuit through 1 and 6, see page 3, lines 22-23) and *capable* of operating at a temperature of at least 800 C (see page 2,

lines 3-12 as well as applicant's admission in said Remarks) in which there circulates a first heat-exchange gas (*helium* gas, see page 3, l. 22) *capable of* cooling said core of said high-temperature reactor (examiner takes official notice heat is inherently produced in the core of any nuclear reactor, and that removal of heat in the high-temperature reactor, - as is evidently effected by said close circuit from the fact that said closed circuit runs through the high-temperature reactor (loc.cit.)), said primary (closed) circuit cools the core through thermal conductivity), a gas turbine 8 coupled to an electric generator 9 via a shaft (see Figure 1) (see page 3, l. 42-46) and a secondary circuit (page 3, l. 23-25; through duct 7) *capable of* circulating a second heat exchange gas ("compressed gas" thereof, see page 3, l. 23-25) on which the gas turbine is inserted (see Figure 1);

at least one intermediate heat exchanger 6 having a primary portion connected to the primary circuit of the high-temperature nuclear reactor 1 (page 3, l. 22-30 and Figure 1) and a second portion to the secondary circuit (heat exchanger 6 overlaps both with 1 and the outside of 1 while being connected through duct 7; see Figure 1) and inherently *capable of* heating the second exchange gas on the basis of the heat produced in the reactor core and transported by the first heat exchange gas (namely: when conditions on the outside of 1 are lower than on the inside, which is generally true in operation). The intermediate heat exchanger 6 and the gas turbine 2 have characteristics adapted to the use of helium as first heat-exchange gas (as mentioned above, the first heat exchange gas *is helium*) and of a mixture of helium and nitrogen (N_2) as second heat-exchange gas (page 2, l. 48-55).

Both limitations on the operating temperature of the core of the nuclear reactor of at least 800 C and the temperature between 550 and 700 C of the second exchange gas when upon the claimed “receiving” or issued from the gas turbine, are limitations of intended use of the claimed device when applied to a nuclear reactor, said nuclear reactor let alone its operating temperature not having been positively recited. Applicant is reminded that limitations on intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963). In the instant case, Griepentrog operates such that the operating temperature of the nuclear reactor core on which the device is applied meets the claim (page 2, lines 3-12). Griepentrog stresses that the reactor exit temperature can be lowered when efficiency is improved to its original value by increasing the number of intermediate cooling steps. See page 4, lines 55-61. It is thus seen that the operating temperature and the temperature of the second exchange gas are design parameters as well as parameters limiting the intended use rather than the device itself. Furthermore, the application of the claimed device is claimed without the requisite dimensions of circuit dimensions, and gas and steam turbine capacities, all of which impact on the applicability of the device as claimed with regard to operating core temperature and second exchange gas temperature.

Griepentrog et al do not necessarily teach the further limitations of (a) “a tertiary circuit for circulation of water and steam, the tertiary circuit having at least one steam generator and at least one steam turbine” such that said steam generator comprises (b) “a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”.

However, it would have been obvious to include said further limitations in view of Nathenson et al, who, in a patent on high temperature nuclear reactor heat production with two high-temperature heat exchange circuits 14 and 20 (title, abstract and col. 5, l. 59 – col. 6, l. 2 and col. 2, l. 57-62), hence analogous art, teaches a final steam loop 34 (col. 6, l. 17-25) meeting the limitation ad (a) above, i.e., “tertiary circuit”, *capable of* “circulating water and steam” on which is disposed at least one steam generator 24 and at least one steam turbine 26 (col. 6, l. 17-25), while combination of the teaching by Nathenson et al with the invention by Griepentrog et al implies limitation ad (b) above, i.e., “a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine (means: condenser 30; loc.cit.) and a primary portion heat exchanger enabling the steam generator 24; cf. Figure 1 and loc.cit.) connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”.

Motivation to include the teaching by Nathenson et al in the device by Griepentrog et al derives from the teaching of the improvement of the electrical

efficiency of a further reduction of the temperature (col. 2, l. 62-64) and, furthermore, in the less demanding mechanical design parameters at reduced operating temperature (col. 2, l. 64-66). Finally, the introduction of the tertiary circuit enables a transformation of the usable energy in its most conventional form of steam thus being able to drive conventional generators of electricity.

The following limitations are, additionally to pre-amble, also functional, i.e., limiting intended use but not limiting the claimed device:

(a) “for cooling the core of the reactor”;

(b) “heating the second exchange gas on the basis of the heat produced in the reactor core by the first heat exchange gas”;

(c) using helium as a first heat exchange gas and of a mixture of helium and nitrogen as a second heat-exchange gas”;

(d) “receiving water at the inlet and to provide steam at the outlet to the stem turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”;

Applicant is reminded that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. What is patentable is only the capability for the claimed intended use. See MPEP 2114.

On claim 20: the secondary circuit in Giepentrog et al includes a single compressor 18 capable of recompressing the second heat exchange gas prior to its reintroduction at

the inlet of the secondary portion of the intermediate heat exchanger 6 (see page 3, lines 47-58 and Fig. 1).

11. ***Claim 15*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Griepentrog et al (GB 2 050 679 A; previously cited and applied to claim 5 above), in view of Nathenson et al (4, 842,054; previously cited and as applied to claim 5 above) and Squires (3,436,909) (previously cited).

Griepentrog et al teach (Figures 1 and 3) a device *capable of* producing electricity from the heat produced in the core (within 1) of at least one high-temperature nuclear reactor 1 comprising a primary circuit (i.e., closed circuit through 1 and 6, see page 3, lines 22-23) in which there circulates a first heat-exchange gas (*helium* gas, see page 3, l. 22) *capable of* cooling said core of said high-temperature reactor (examiner takes official notice heat is inherently produced in the core of any nuclear reactor, and that removal of heat in the high-temperature reactor, - as is evidently effected by said close circuit from the fact that said closed circuit runs through the high-temperature reactor (loc.cit.)), said primary (closed) circuit cools the core through thermal conductivity), a gas turbine 8 coupled to an electric generator 9 via a shaft (see Figure 1) (see page 3, l. 42-46) and a secondary circuit (page 3, l. 23-25; through duct 7) *capable of* circulating a second heat exchange gas ("compressed gas" thereof, see page 3, l. 23-25) on which the gas turbine is inserted (see Figure 1);

at least one intermediate heat exchanger 6 having a primary portion connected to the primary circuit of the high-temperature nuclear reactor 1 (page 3, l. 22-30 and Figure 1) and a second portion to the secondary circuit (heat exchanger 6 overlaps both with 1

and the outside of 1 while being connected through duct 7; see Figure 1) and inherently *capable of* heating the second exchange gas on the basis of the heat produced in the reactor core and transported by the first heat exchange gas (namely: when conditions on the outside of 1 are lower than on the inside, which is generally true in operation). The intermediate heat exchanger 6 and the gas turbine 2 have characteristics adapted to the use of helium as first heat-exchange gas (as mentioned above, the first heat exchange gas *is helium*) and of a mixture of helium and nitrogen (N_2) as second heat-exchange gas (page 2, l. 48-55).

Griepentrog et al do not necessarily teach the further limitations of (a) “a tertiary circuit for circulation of water and steam, the tertiary circuit having at least one steam generator and at least one steam turbine” such that said steam generator comprises (b) “a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”.

However, it would have been obvious to include said further limitations in view of Nathenson et al, who, in a patent on high temperature nuclear reactor heat production with two high-temperature heat exchange circuits 14 and 20 (title, abstract and col. 5, l. 59 – col. 6, l. 2 and col. 2, l. 57-62), hence analogous art, teaches a final steam loop 34 (col. 6, l. 17-25) meeting the limitation ad (a) above, i.e., “tertiary circuit”, *capable of* “circulating water and steam” on which is disposed at least one steam generator 24 and at least one steam turbine 26 (col. 6, l. 17-25), while combination of the teaching by

Nathenson et al with the invention by Griepentrog et al implies limitation ad (b) above, i.e., "a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine (means: condenser 30; loc.cit.) and a primary portion heat exchanger enabling the steam generator 24; cf. Figure 1 and loc.cit.) connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine".

Motivation to include the teaching by Nathenson et al in the device by Griepentrog et al derives from the teaching of the improvement of the electrical efficiency of a further reduction of the temperature (col. 2, l. 62-64) and, furthermore, in the less demanding mechanical design parameters at reduced operating temperature (col. 2, l. 64-66). Finally, the introduction of the tertiary circuit enables a transformation of the usable energy in its most conventional form of steam thus being able to drive conventional generators of electricity.

Neither Griepentrog et al nor Nathenson et al necessarily teach the limitation on tertiary circuit, lines 18-28, except that Nathenson et al do teach the limitation on condenser (see condenser 30, Figure 1).

However, it would have been obvious to include said limitation in view of Squires, who, in a patent on an apparatus for combined gas-steam cycle inter alia for a nuclear power reactor (col. 5, l. 15-24, title, abstract and "Summary of the Invention"), hence analogous art, teach "increased efficiency and unusual economy" and in an invention "well suited for use of nuclear heat" (col. 1, l. 25-48) based on the adding of heat to steam between consecutive (steam) turbine expansions in series in turbines along one

shaft connected to the electricity generator: see heat exchangers 14, 15 and 16 and steam turbines 3, 4 and 5 (Figure 2) (col. 5, l. 63 – col. 6, l. 42). It would have been obvious to include the teaching by Squires in the Steam Loop by Nathenson et al, and hence in the combined invention, because of the teaching by Squires of increased efficiency. Finally, it would have been obvious to include the limitation that the tertiary circuit is closed because one of ordinary skill in the art would deem it obvious to thereby improve thermal efficiency through the avoidance of high-temperature steam loss.

The following limitations are functional, i.e., limiting intended use but not limiting the claimed device:

(a) “for cooling the core of the reactor”;

(b) “heating the second exchange gas on the basis of the heat produced in the reactor core by the first heat exchange gas”;

(c) “using helium as a first heat exchange gas and of a mixture of helium and nitrogen as a second heat-exchange gas”;

(d) “receiving water at the inlet and to provide steam at the outlet to the stem turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”;

(e) “receiving wet steam…";

(f) “to heat and dry the wet steam introduced at the inlet of the second portion of the heat exchange heater”.

Applicant is reminded that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the

claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. What is patentable is only the capability for the claimed intended use. See MPEP 2114.

12. ***Claim 16*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Griepentrog et al (GB 2 050 679 A; previously cited and applied to claim 5 above), in view of Nathenson et al (4, 842,054; previously cited and as applied to claim 5 above), Squires (3,436,909) (previously cited) and Werker et al (4,236,968) (previously cited).

Griepentrog et al teach (Figures 1 and 3) a device *capable of* producing electricity from the heat produced in the core (within 1) of at least one high-temperature nuclear reactor 1 comprising a primary circuit (i.e., closed circuit through 1 and 6, see page 3, lines 22-23) in which there circulates a first heat-exchange gas (*helium* gas, see page 3, l. 22) *capable of* cooling said core of said high-temperature reactor (examiner takes official notice heat is inherently produced in the core of any nuclear reactor, and that removal of heat in the high-temperature reactor, - as is evidently effected by said close circuit from the fact that said closed circuit runs through the high-temperature reactor (loc.cit.)), said primary (closed) circuit cools the core through thermal conductivity), a gas turbine 8 coupled to an electric generator 9 via a shaft (see Figure 1) (see page 3, l. 42-46) and a secondary circuit (page 3, l. 23-25; through duct 7) *capable of* circulating a second heat exchange gas ("compressed gas" thereof, see page 3, l. 23-25) on which the gas turbine is inserted (see Figure 1);

at least one intermediate heat exchanger 6 having a primary portion connected to the primary circuit of the high-temperature nuclear reactor 1 (page 3, l. 22-30 and Figure

1) and a second portion to the secondary circuit (heat exchanger 6 overlaps both with 1 and the outside of 1 while being connected through duct 7; see Figure 1) and inherently *capable of* heating the second exchange gas on the basis of the heat produced in the reactor core and transported by the first heat exchange gas (namely: when conditions on the outside of 1 are lower than on the inside, which is generally true in operation). The intermediate heat exchanger 6 and the gas turbine 2 have characteristics adapted to the use of helium as first heat-exchange gas (as mentioned above, the first heat exchange gas *is helium*) and of a mixture of helium and nitrogen (N_2) as second heat-exchange gas (page 2, l. 48-55).

Griepentrog et al do not necessarily teach the further limitations of (a) "a tertiary circuit for circulation of water and steam, the tertiary circuit having at least one steam generator and at least one steam turbine" such that said steam generator comprises (b) "a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine".

However, it would have been obvious to include said further limitations in view of Nathenson et al, who, in a patent on high temperature nuclear reactor heat production with two high-temperature heat exchange circuits 14 and 20 (title, abstract and col. 5, l. 59 – col. 6, l. 2 and col. 2, l. 57-62), hence analogous art, teaches a final steam loop 34 (col. 6, l. 17-25) meeting the limitation ad (a) above, i.e., "tertiary circuit", *capable of* "circulating water and steam" on which is disposed at least one steam generator 24 and

at least one steam turbine 26 (col. 6, l. 17-25), while combination of the teaching by Nathenson et al with the invention by Griepentrog et al implies limitation ad (b) above, i.e., “a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine (means: condenser 30; loc.cit.) and a primary portion heat exchanger enabling the steam generator 24; cf. Figure 1 and loc.cit.) connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”.

Motivation to include the teaching by Nathenson et al in the device by Griepentrog et al derives from the teaching of the improvement of the electrical efficiency of a further reduction of the temperature (col. 2, l. 62-64) and, furthermore, in the less demanding mechanical design parameters at reduced operating temperature (col. 2, l. 64-66). Finally, the introduction of the tertiary circuit enables a transformation of the usable energy in its most conventional form of steam thus being able to drive conventional generators of electricity.

Neither Griepentrog et al nor Nathenson et al necessarily teach the limitation on tertiary circuit, lines 18-28, except that Nathenson et al do teach the limitation on condenser (see condenser 30, Figure 1).

However, it would have been obvious to include said limitation in view of Squires, who, in a patent on an apparatus for combined gas-steam cycle inter alia for a nuclear power reactor (col. 5, l. 15-24, title, abstract and “Summary of the Invention”), hence analogous art, teach “increased efficiency and unusual economy” and in an invention “well suited for use of nuclear heat” (col. 1, l. 25-48) based on the adding of heat to

steam between consecutive (steam) turbine expansions in series in turbines along one shaft connected to the electricity generator: see heat exchangers 14, 15 and 16 and steam turbines 3, 4 and 5 (Figure 2) (col. 5, l. 63 – col. 6, l. 42). It would have been obvious to include the teaching by Squires in the Steam Loop by Nathenson et al, and hence in the combined invention, because of the teaching by Squires of increased efficiency. Finally, it would have been obvious to include the limitation that the tertiary circuit is closed because one of ordinary skill in the art would deem it obvious to thereby improve thermal efficiency through the avoidance of high-temperature steam loss.

Although none of the above references teach the limitation on a counter-current heat exchanger as recited in the final six lines of the claim, it would have been obvious to include a heat exchanger being disposed as recited in the claim in view of Werker et al, who teach a pre-heater embodied as a heat exchanger (15) (col. 2, l. 27-34 and l. 59-62; see Figure) so as to preheat the water input into the steam generator (2) (loc. cit.), while said pre-heater is also used as after-heat removal means (loc.cit.); one of ordinary skill in the art would deem it obvious to feed preheated water rather than cold water to a steam generator for efficiency, for which examine takes official notice. Including the teaching by Werker et al places the pre-heater as heat exchanger just before the inlet to the steam generator and thus meets the claim limitation, on heat exchanger being disposed as recited, in the combined invention as defined by the above combination of Griepentrog et al, Nathenson et al and Squires, while the heat exchanger by Werker et al is necessarily a counter-current heat exchanger as used both for steam-generator-inlet pre-heater and after-heat remover because the inlet stream of water and the steam

flow from which after-heat is removed are necessarily counter-flowing when brought together in the same heat exchanger.

The following limitations are functional, i.e., limiting intended use but not limiting the claimed device:

(a) “for cooling the core of the reactor”;

(b) “heating the second exchange gas on the basis of the heat produced in the reactor core by the first heat exchange gas”;

(c) “using helium as a first heat exchange gas and of a mixture of helium and nitrogen as a second heat-exchange gas”;

(d) “receiving water at the inlet and to provide steam at the outlet to the stem turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”;

(e) “receiving wet steam";

(f) “to heat and dry the wet steam introduced at the inlet of the second portion of the heat exchange heater”; and

(g) “for returning condensed water to the inlet of the secondary portion of the steam generator”.

Applicant is reminded that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. What is patentable is only the capability for the claimed intended use. See MPEP 2114.

13. ***Claim 17 and 18*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Griepentrog et al (GB 2 050 679 A; previously cited and applied above to claims 5 and 11) and Nathenson et al (4,842,054; previously cited and as applied above to claim 5 above) in view of Naito et al (4,714,593) (previously cited).

On claim 17: Griepentrog et al teach (Figures 1 and 3) a device *capable of* producing electricity from the heat produced in the core (within 1) of at least one high-temperature nuclear reactor 1 comprising a primary circuit (i.e., closed circuit through 1 and 6, see page 3, lines 22-23) in which there circulates a first heat-exchange gas (*helium* gas, see page 3, l. 22) *capable of* cooling said core of said high-temperature reactor (examiner takes official notice heat is inherently produced in the core of any nuclear reactor, and that removal of heat in the high-temperature reactor, - as is evidently effected by said close circuit from the fact that said closed circuit runs through the high-temperature reactor (loc.cit.)), said primary (closed) circuit cools the core through thermal conductivity), a gas turbine 8 coupled to an electric generator 9 via a shaft (see Figure 1) (see page 3, l. 42-46) and a secondary circuit (page 3, l. 23-25; through duct 7) *capable of* circulating a second heat exchange gas ("compressed gas" thereof, see page 3, l. 23-25) on which the gas turbine is inserted (see Figure 1);

at least one intermediate heat exchanger 6 having a primary portion connected to the primary circuit of the high-temperature nuclear reactor 1 (page 3, l. 22-30 and Figure 1) and a second portion to the secondary circuit (heat exchanger 6 overlaps both with 1 and the outside of 1 while being connected through duct 7; see Figure 1) and inherently *capable of* heating the second exchange gas on the basis of the heat produced in the

reactor core and transported by the first heat exchange gas (namely: when conditions on the outside of 1 are lower than on the inside, which is generally true in operation). The intermediate heat exchanger 6 and the gas turbine 2 have characteristics adapted to the use of helium as first heat-exchange gas (as mentioned above, the first heat exchange gas *is helium*) and of a mixture of helium and nitrogen (N_2) as second heat-exchange gas (page 2, l. 48-55).

Griepentrog et al do not necessarily teach the further limitations of (a) “a tertiary circuit for circulation of water and steam, the tertiary circuit having at least one steam generator and at least one steam turbine” such that said steam generator comprises (b) “a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”.

However, it would have been obvious to include said further limitations in view of Nathenson et al, who, in a patent on high temperature nuclear reactor heat production with two high-temperature heat exchange circuits 14 and 20 (title, abstract and col. 5, l. 59 – col. 6, l. 2 and col. 2, l. 57-62), hence analogous art, teaches a final steam loop 34 (col. 6, l. 17-25) meeting the limitation ad (a) above, i.e., “tertiary circuit”, *capable of* “circulating water and steam” on which is disposed at least one steam generator 24 and at least one steam turbine 26 (col. 6, l. 17-25), while combination of the teaching by Nathenson et al with the invention by Griepentrog et al implies limitation ad (b) above, i.e., “a secondary portion connected to the tertiary steam and steam circuit to receive

water at the inlet and to provide steam at the outlet to the steam turbine (means: condenser 30; loc.cit.) and a primary portion heat exchanger enabling the steam generator 24; cf. Figure 1 and loc.cit.) connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine".

Motivation to include the teaching by Nathenson et al in the device by Griepentrog et al derives from the teaching of the improvement of the electrical efficiency of a further reduction of the temperature (col. 2, l. 62-64) and, furthermore, in the less demanding mechanical design parameters at reduced operating temperature (col. 2, l. 64-66). Finally, the introduction of the tertiary circuit enables a transformation of the usable energy in its most conventional form of steam thus being able to drive conventional generators of electricity.

Neither Griepentrog et al nor Nathenson et al necessarily teach the limitation that the intermediate heat exchanger is a plate exchanger. However, plate heat exchangers have long been in use in the thermal power industry, as witnessed for instance by Naito et al, who, in a patent on heat exchange technology (title, abstract and col. 1, l. 5 – col. 2, l. 26), hence analogous in this regard to Griepentrog et al, teach a plate exchanger as a possible embodiment for heat exchanger 60 (Figures 1B and 5; and col. 9, l. 40-60). Hence all of the components recited in claim 17 are known, the only difference being the combination of old elements into a single device. Thus, it would have been obvious to one of ordinary skill in the art to select a plate exchanger, for instance a plate-fin exchanger, for the intermediate heat exchanger, since the operation of the plate exchanger is in no way dependent upon the operation of the other components, -

because heat exchange of fluids with a plate surface or a plate-fin structure is effective regardless the fluid, given the large surface area available for heat exchange with a surface and/or fin, and given that both fluids involved in the intermediate exchanger by Griepentrog et al are characterized with positive thermal conductivity (see Abstract in Griepentrog et al, and see, for instance Chapman and Cowling, “Mathematical Theory of Non-Uniform Gases”, 13.2, in particular Table 20 (see experimental values for helium and nitrogen)). Given the exchange gas composition, and the sizable thermal diffusivities of the participating gases, the selection of a plate exchanger is obvious merely considering the large surface area over which the heat exchange takes place. Therefore, the claim would have been obvious because a person of ordinary skill has good reason (large surface area involved in the heat exchange) to pursue known options (including the tested plate exchanger or plate-fin exchanger) within his or her technical grasp. If this leads to the anticipated success, then it is likely the product not of innovation but of ordinary skill and common sense.

The following limitations are functional, i.e., limiting intended use but not limiting the claimed device:

(a) “for circulation of a second heat-exchange gas on which the gas turbine is inserted”;

(b) “heating the second exchange gas on the basis of the heat produced in the reactor core by the first heat-exchange gas”;

(c) “using helium as a first heat-exchange gas and of a mixture of helium and nitrogen as a second heat-exchange gas”;

(d) “receiving water at the inlet and to provide steam at the outlet of the steam turbine”; and

(e) “receiving the second exchange gas after it issues from the gas turbines”.

Applicant is reminded that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. What is patentable is only the capability for the claimed intended use. See MPEP 2114.

<u>*On claim 18:*</u> *Griepentrog et al teach* (Figures 1 and 3) a device *capable of* producing electricity from the heat produced in the core (within 1) of at least one high-temperature nuclear reactor 1 comprising a primary circuit (i.e., closed circuit through 1 and 6, see page 3, lines 22-23) in which there circulates a first heat-exchange gas (*helium* gas, see page 3, l. 22) *capable of* cooling said core of said high-temperature reactor (examiner takes official notice heat is inherently produced in the core of any nuclear reactor, and that removal of heat in the high-temperature reactor, - as is evidently effected by said close circuit from the fact that said closed circuit runs through the high-temperature reactor (loc.cit.)), said primary (closed) circuit cools the core through thermal conductivity), a gas turbine 8 coupled to an electric generator 9 via a shaft (see Figure 1) (see page 3, l. 42-46) and a secondary circuit (page 3, l. 23-25; through duct 7) *capable of* circulating a second heat exchange gas (“compressed gas” thereof, see page 3, l. 23-25) on which the gas turbine is inserted (see Figure 1);

at least one intermediate heat exchanger 6 having a primary portion connected to the primary circuit of the high-temperature nuclear reactor 1 (page 3, l. 22-30 and Figure 1) and a second portion to the secondary circuit (heat exchanger 6 overlaps both with 1 and the outside of 1 while being connected through duct 7; see Figure 1) and inherently *capable of* heating the second exchange gas on the basis of the heat produced in the reactor core and transported by the first heat exchange gas (namely: when conditions on the outside of 1 are lower than on the inside, which is generally true in operation). The intermediate heat exchanger 6 and the gas turbine 2 have characteristics adapted to the use of helium as first heat-exchange gas (as mentioned above, the first heat exchange gas *is helium*) and of a mixture of helium and nitrogen (N_2) as second heat-exchange gas (page 2, l. 48-55).

Griepentrog et al also teach the secondary circuit being entirely closed (page 2, lines 59-60) and including a compressor (either 14, 16, 18 or any combination thereof may be activated depending on the desired compression ratio; see Abstract and page 3, lines 47-57) *capable of* recompressing the second heat exchange gas to a desired or predetermined pressure level, prior to its reintroduction (page 3, line 55) at the inlet of the secondary portion of the intermediate exchanger. The limitation “substantially equal to the pressure of the first heat-exchange gas” does not carry patentable weight, limiting only the intended use of said compressor. Intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the

prior art structure is capable of performing the intended use, then it meets the claim. In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963).

Griepentrog et al do not necessarily teach the further limitations of (a) “a tertiary circuit for circulation of water and steam, the tertiary circuit having at least one steam generator and at least one steam turbine” such that said steam generator comprises (b) “a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine and a primary portion connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”.

However, it would have been obvious to include said further limitations in view of Nathenson et al, who, in a patent on high temperature nuclear reactor heat production with two high-temperature heat exchange circuits 14 and 20 (title, abstract and col. 5, l. 59 – col. 6, l. 2 and col. 2, l. 57-62), hence analogous art, teaches a final steam loop 34 (col. 6, l. 17-25) meeting the limitation ad (a) above, i.e., “tertiary circuit”, *capable of* “circulating water and steam” on which is disposed at least one steam generator 24 and at least one steam turbine 26 (col. 6, l. 17-25), while combination of the teaching by Nathenson et al with the invention by Griepentrog et al implies limitation ad (b) above, i.e., “a secondary portion connected to the tertiary steam and steam circuit to receive water at the inlet and to provide steam at the outlet to the steam turbine (means: condenser 30; loc.cit.) and a primary portion heat exchanger enabling the steam generator 24; cf. Figure 1 and loc.cit.) connected to the secondary circuit to receive the second exchange gas after it issues from the gas turbine”.

Motivation to include the teaching by Nathenson et al in the device by Griepentrog et al derives from the teaching of the improvement of the electrical efficiency of a further reduction of the temperature (col. 2, l. 62-64) and, furthermore, in the less demanding mechanical design parameters at reduced operating temperature (col. 2, l. 64-66). Finally, the introduction of the tertiary circuit enables a transformation of the usable energy in its most conventional form of steam thus being able to drive conventional generators of electricity.

Neither Griepentrog et al nor Nathenson et al necessarily teach the limitation that the intermediate heat exchanger is a plate exchanger. However, plate heat exchangers have long been in use in the thermal power industry, as witnessed for instance by Naito et al, who, in a patent on heat exchange technology (title, abstract and col. 1, l. 5 – col. 2, l. 26), hence analogous in this regard to Griepentrog et al, teach a plate exchanger as a possible embodiment for heat exchanger 60 (Figures 1B and 5; and col. 9, l. 40-60). Hence all of the components recited in claim 17 are known, the only difference being the combination of old elements into a single device. Thus, it would have been obvious to one of ordinary skill in the art to select a plate exchanger, for instance a plate-fin exchanger, for the intermediate heat exchanger, since the operation of the plate exchanger is in no way dependent upon the operation of the other components, -because heat exchange of fluids with a plate surface or a plate-fin structure is effective regardless the fluid, given the large surface area available for heat exchange with a surface and/or fin, and given that both fluids involved in the intermediate exchanger by Griepentrog et al are characterized with positive thermal conductivity (see Abstract in

Griepentrog et al, and see, for instance Chapman and Cowling, “Mathematical Theory of Non-Uniform Gases”, 13.2, in particular Table 20 (see experimental values for helium and nitrogen)). Given the exchange gas composition, and the sizable thermal diffusivities of the participating gases, the selection of a plate exchanger is obvious in light of the large surface area over which the heat exchange takes place. Therefore, the claim would have been obvious because a person of ordinary skill has good reason (large surface area involved in the heat exchange) to pursue known options (including the tested plate exchanger or plate-fin exchanger) within his or her technical grasp. If this leads to the anticipated success, then it is likely the product not of innovation but of ordinary skill and common sense.

The following limitations are functional, i.e., limiting intended use but not limiting the claimed device:

(a) “for circulation of a second heat-exchange gas on which the gas turbine is inserted”;

(b) “heating the second exchange gas on the basis of the heat produced in the reactor core the first heat-exchange gas”;

(c) “using helium as a first heat-exchange gas and of a mixture of helium and nitrogen as a second heat-exchange gas”;

(d) “receiving water at the inlet and to provide steam at the outlet to the steam turbine";

(e) receiving the second exchange gas after it issues from the gas turbine”; and

(f) “for recompressing the second exchange gas to a pressure which is substantially equal to the pressure of the first heat exchange gas in the primary circuit of the nuclear reactor prior to its reintroduction at the inlet of the secondary portion of the intermediate exchanger”.

Applicant is reminded that a claim containing a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. What is patentable is only the capability for the claimed intended use. See MPEP 2114.

14. ***Claim 21*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Griepentrog et al (GB 2 050 679 A) (see IDS filed 10/12/04) in view of Nathenson et al (4,842,054), or, in the alternative, over the foregoing references to Griepentrog et al and Nathenson et al in view of Berchtold et al (3,218,807) (all previously cited).

This rejection is offered to the best of examiner’s understanding, referring to the rejection under 35 U.S.C. 112, second paragraph, with reference to sections 7-9 above.

As detailed above, claim 5 is unpatentable over Griepentrog et al in view of Nathenson et al. Neither of these references necessarily teach the specific range for the compression ratio as claimed. However, (a) Applicant does not explain why the claimed range (disclosure through page 15 of the original specification) is critical to the invention. Furthermore, referral is made in the disclosure to a value of the pressure of the secondary exchange fluid recovered at the outlet of heat exchanger 16, which is, however, NOT claimed, and therefore, the claimed range is not critical to the invention

as claimed. Hence, said range is merely a matter of finding the optimum working conditions by routine experimentation for one of ordinary skill in the art. See MPEP 2144.05 II). Furthermore, even arguendo, (b) it would have been obvious to include said range in view of Berchtold et al, who, in a patent on a power plant utilizing a gas turbine, hence analogous art, teach a compression ratio of up to about 2.5 (see col. 6, l. 3). Applicant is reminded that a *prima facie* case of obviousness typically exists when the ranges as claimed overlap the ranges disclosed in the prior art or when the ranges as claimed do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties (See MPEP 2144.05 I).

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHANNES P. MONDT whose telephone number is (571)272-1919. The examiner can normally be reached on 7:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Johannes P Mondt/
Primary Examiner, Art Unit 3663